Date: Name: Class:

Problem Solving

Chapter 3

BLM 3-2

Adding and Subtracting Vectors

Goal

Practise adding and subtracting vectors.

Procedure

Answer the following questions:

1. A girl hikes 6.0 km[S55°W], 9.0 km[W], and 8.0 km[N]. The entire trip takes 5.0 h. Use the graphical method to answer these questions.

   (a) What is the total distance of the hiking trip?

   (b) What is the total displacement of her trip?

   (c) What is the average velocity of the trip?

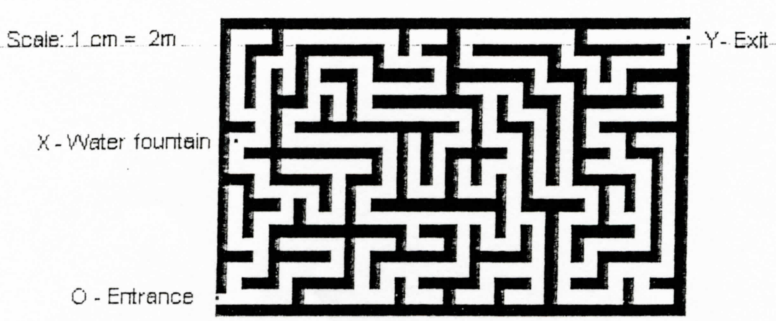
2. Two cars leave an intersection, one headed south at 55.0 km/h and the other headed east at 75.0 km/h. Use the graphical method to determine how far apart are they after 0.5 h.

3. Vector A is 7.0 km[N], vector B is 3.0 km[W] and vector C is 5.0 km[N33°E]. Find the resultant of the following vector operations graphically.

   (a) $A + 3B - 2C$

   (b) $C - \frac{1}{2}A - 2B$

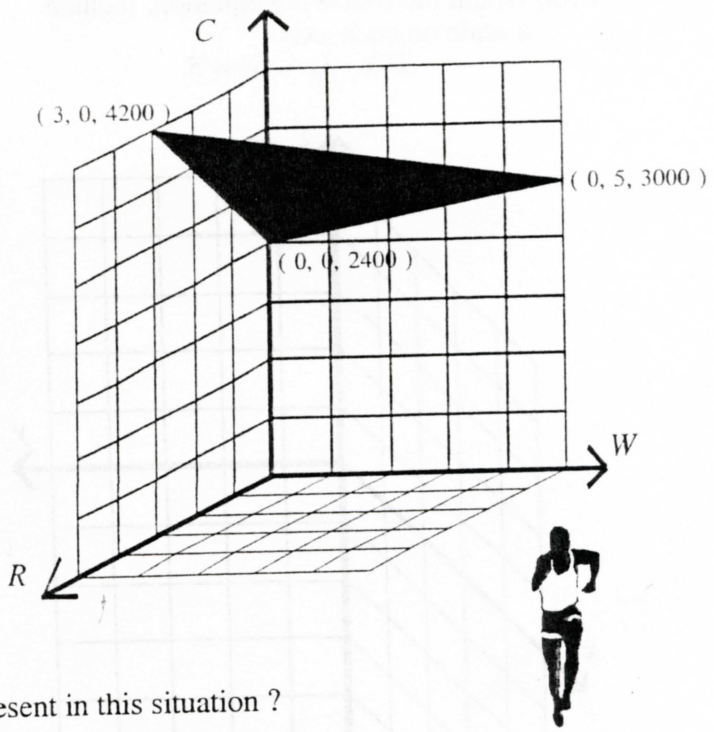
4. On your way to school, you stop at a water fountain at point X, located inside a maze. You must exit the maze at Y, so that you don't miss your physics class. Determine the displacement, using a ruler and protractor, from the water fountain to the exit of the maze. Explain why your total distance travelled in the maze would be greater than the displacement between the entrance and the exit. Show your path through the maze.



3-D Graphs in the Real World

Name : _____

Ryan was doing a literature search for one of his physical education assignments and discovered some interesting statistics. He discovered that if a person did nothing all day ; that is, he became a couch-potato, his body would still require 2400 calories per day just to survive. If an individual exercises by walking, he will require an additional 120 calories for each hour he walks. If an individual exercises by running, he will require an additional 600 calories for each hour he runs. Ryan decides to model this situation on a 3-D coordinate grid where C is the calories required each day, W is the number of hours one walks each day, and R is the number of hours one runs each day. The resulting plane is shown on the right.



1. What is the equation of the plane ?

2. What is the C-intercept and what does it represent in this situation ?

3. Complete the ordered triple (3, W, 4500) and explain what the ordered triple represents in this situation ?

4. Is the R-intercept positive, negative, or equal to zero. Does it represent anything in terms of this real world problem ? If so, what does it represent ?

5. (a) What is the equation of the W - C trace ?
(b) What is the equation of the R - C trace ?

6. How would the plane change if with no exercise your body required 2000 calories per day to survive ?

7. How would the plane change if the number of calories required to run for an hour and walk for an hour were greater ?

8. How would the plane change if walking didn't increase your need for calories ?

9. If the W - C trace was $C = 140W + 2600$ and the R - C trace was $C = 500R + 2600$, how would the situation have changed ? What would be the equation of the resulting plane ?

10. Based on the original plane, if an individual walked for twice as long as he ran and required 3450 calories for the day, how long did he walk ?

11. Lets change one of the variables. Change W to M, where M represents the number of hours one meditates during the day. Some claim that for each hour you meditate, your body requires 20 fewer calories per hour. What would be the equation of the resulting plane that describes the relationship between the variables C, R, and M ? How would the new plane compare to the one provided at the top of this page ?